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ABSTRACT

This document contains a program evaluation of science education in grades K-12 in the Des Moines Independent School District in Iowa. Sections include: (1) an abstract of the evaluation; (2) a preface containing mission statements; (3) the context evaluation referring to curriculum, goals, and demographics; (4) input evaluation with budgetary details and figures on technology and community resources; (5) the process evaluation which details ongoing efforts that focus on science education; (6) the product evaluation highlighting accomplishments, strengths, deficiencies, improvement plans, and staff accolades; and (7) speculations on the future of science education in the district. Appendices contain data on mastery levels, attitude survey results, and a standards comparison. (DDR)

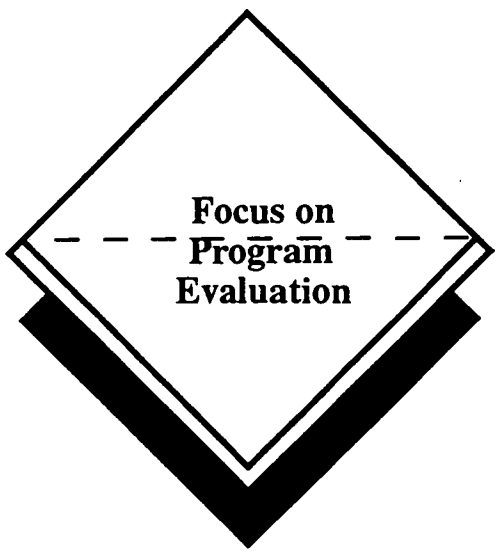
96-394

DIVISION OF TEACHING AND LEARNING

PROGRAM EVALUATION

SCIENCE EDUCATION
GRADES K-12

Des Moines Independent Community School District
Des Moines, Iowa 50309-3399



January 7, 1997

EVALUATION ABSTRACT

SCIENCE
FALL, 1996

CONTEXT EVALUATION

The science program in the Des Moines Public Schools provides an opportunity for all students to explore, discover, and learn background knowledge, skills, and values of science.

Science is taught in all elementary grades using a hands-on program where students learn by being actively involved. A new middle school science program was introduced in the fall of 1995. This program utilizes themes which are revisited each year. The program builds on the process and investigative skills learned in elementary school. The high school program allows students to select and further increase their skills and background in science through basic courses such as Earth Science, Biology, Chemistry, and Physics and through more advanced courses such as Marine Biology, Advanced Biology, Advanced Placement Biology, Advanced Placement Chemistry, and Advanced Placement Physics.

INPUT EVALUATION

Resources to operate the science program include district and building supply budgets, student fees, curriculum and textbook budgets, Eisenhower (federal) funds, and grants. Eisenhower funds have increased during the past three years. There have been significant increases in the grants received, partially through cooperation with Iowa State University and the University of Iowa.

For 1996-97, salaries and benefits for science instruction will total, $7,202,940; materials costs budgeted are $104,500; staff development costs will be approximately $50,000.

Community resources used extensively have been the Science Center of Iowa, the Botanical Center, and the Blank Park Zoo. Speakers from various businesses and industries, as well as organizations assist in creating awareness of applications and value of science.

A new science program for grades kindergarten, third, fourth, and fifth was introduced in the fall of 1993 and for grades one and two in the fall of 1995 at a total cost of $347,000.

A new science program for middle school was introduced inthe fall of 1995 at a cost of $306,300.

PROCESS EVALUATION

Through input from teachers and other administrators, decisions for planning, implementing, staff development and evaluation are made. During the past three years staff development emphasis has been on providing teachers a review of the new elementary and middle school science programs, content upgrade for elementary teachers, improvement of computer skills, and sharing of activities and ideas. Technology is changing the way teachers teach, mainly at the middle ard high school levels. Computer and laser disc programs are providing visuals for increased comprehension as well as interactive learning that promotes higher order thinking.

A closer alignment of assessment items on the district criterion tests and the critical objectives has been made in order to address the first goal of the District Improvement Plan related to student mastery on district tests. New tests have been written, or are in the process of being written, for all areas and levels. The new tests are module-based rather than year or semester end tests.

Building objectives target achieving mastery levels, integration of the disciplines, and improving the magnet program.

PRODUCT EVALUATION

Proving a quality science program for all students directs decisions related to change. A new K-8 program has been introduced during the years 1993-1996. The new program places greater emphasis on problem solving, developing investigative and communication skills, and societal issues. More teaming and integration of disciplines is occurring. The science portion of the ITBS test is now being given to middle school students. The average of the scores is above grade level, using national norms. The percent of elementary students achieving at or above the 70% mastery level for grades 3-5 ranged from 65.4 to 84.5 in 1995-1996. The percent of students in biology, chemistry, and physics achieving 70% mastery ranged from 40.3 to 74.1. For earth/space science the percent was 17.4%. Students scoring 3 or higher on AP exams range from 56 to 100 percent, depending on the course.

The percent of minorities enrolled in earth/space science is above the district percent of minorities but is below in all other sciences, and considerably lower in advanced classes. The percent of females enrolled in earth/space, biology, chemistry, and physics exceeds the district percent of females, but enrollment in AP courses is lower than the district percent.

Eighteen teachers have received awards for their teaching in the last three years. Six hold positions in the Iowa Academy of Science.

Teachers are using more performance assessments, integrating technology into the curriculum, and changing instructional styles from less direct instruction to more guided instruction.

FUTURE PLANNING

The top six identified needs of the district in science are:

- introduction of a two year science requirement for high school students
- introduction of a high school gateway science course for all ninth grade students
- coordination with other curricular areas in career pathways and school to work program initiatives
- addressing recommendations related to the curricular audit
- improving instructional conditions
- utilizing community resources to a greater degree

Increasing the science requirement would demonstrate a commitment to the importance the district places on science. The gateway course would assure that all students have the opportunity to receive background in the fundamental objectives in science. The coordination with career pathway and school to work initiatives would address needs in skill areas for both college and non-college students. Improving instructional conditions would decrease frustrations of staff with working conditions and result in improved student satisfaction and learning. Increase utilization of community resources would expand student experiences and increase their awareness of the environment, career opportunities, and the application of what they are learning.

A copy of the complete report is available upon request from the Department of School Improvement, Des Moines Independent Community School District, 1800 Grand Avenue, Des Moines, Iowa 50309-3399. Telephone: 515/242-7836.
All evaluation reports are submitted to the Educational Resources Information Center (ERIC) and Educational Research Service (ERS).

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SCIENCE, GRADES K-12

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January 7, 1997

DISTRICT MISSION STATEMENT

DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT
DES MOINES, IOWA

The Des Moines Independent Community School District will provide a quality educational program to a diverse community of students where all are expected to learn.

SCIENCE MISSION STATEMENT

The science program will provide an opportunity for all students to explore, discover, and learn background knowledge, skills, and values of science.

SUPERVISOR'S RESPONSIBILITY

The responsibility of the supervisor of science of the Des Moines Public Schools is to: (1) focus the teaching of science through an appropriate and effective curriculum; (2) facilitate instructional improvement; (3) provide technical assistance, and (4) serve as the district chemical hygiene officer.

CONTEXT EVALUATION

This program evaluation is about teachers and students doing and learning about science in the Des Moines Public Schools. A strong foundation in science is important for all students. Basic science knowledge about ourselves and the world around us helps us appreciate the world, understand the world, and function in the world. This report will describe how science literacy is accomplished in the Des Moines Public Schools.

History

Elementary

The Des Moines Public Schools has had a history of activity based science programs. In 1968, "Science-A Process Approach" (SAPA) was introduced. This was followed by the use of another activity based program called Delta Science. In January, 1993, the board adopted Addison-Wesley's *Exploration in Science and Mathematics* for kindergarten, and a combination of "Full Option Science System" (FOSS) and "Delta" modules for grades three, four, and five. In 1995, a combination of FOSS and Harcourt Brace programs was adopted for grades one and two. Each of these programs is an activity based program.

Middle School

In 1995, the middle school science program was changed from general science in grade six, life science in grade seven, and physical science in grade eight to a program that integrated and sequenced each science discipline in grades six, seven, and eight. The program is based on themes which are revisited each year.

One classroom at Merrill was converted to a science room and remodeled in the summer of 1996.

High School

The high school instructional program is similar to that described in the 1993 Program Evaluation Report. Applied Science, a course with emphasis on health, ecology, weather, and science technology, was added to all high schools in the fall of 1990. Biology II was added to all high schools in the fall of 1993.

Major changes in science facilities were made during 1990 and 1991. Two new science rooms were added and one was remodeled at Lincoln. The physics and chemistry rooms and two earth science rooms were remodeled at East. Two multipurpose science rooms were remodeled and enlarged at Roosevelt. Two biology classrooms were remodeled at North and modifications were made to all science rooms at Hoover.

See the 1990 Program Evaluation Report for a more complete history.

Policies, Standards, and Regulations

Code of Iowa Requirements

12.5(3d) Elementary program, grades 1-6. Science instruction shall include life, earth, and physical science and shall incorporate hands-on process skills; scientific knowledge; application of the skills and knowledge to students and society; conservation of natural resources; and environmental awareness.

12.5(4d) Junior high program, grades 7 and 8. Science instruction shall include life, earth, and physical science and shall incorporate hands-on process skill; scientific knowledge; application of the skills and knowledge to students and society; conservation of natural resources; and environmental awareness.

12.5(5d) High school program, grades 9-12 (five units). Science instruction shall include biological, earth, and physical science, including physics and chemistry. Full units of chemistry and physics shall be taught but may be offered in alternate years. All science instruction shall incorporate hands-on process skills; scientific knowledge; the application of the skills and knowledge to students and society; conservation of natural resources; and environmental awareness.

In 1989, the State Legislature mandated that "ground-water" education be a part of the curriculum in seventh and eighth grade.

School Accreditation Standards (Iowa Administrative Code, Chapter 12) Specific to Science-Offer and Teach: 5 units of Science (Chemistry and Physics may be offered in alternate years).

District Requirements:

One year of science, grade 9-12, is required for graduation.

College Entrance Requirements:

Iowa State University and The University of Iowa: Three years of science including one year of courses from two of the following fields: biology, chemistry, and physics and rank in the upper half of the high school graduating class or have an ACT composite of 24 or an SAT combined score of at least 980. (These requirements are not necessarily rigid.)

University of Northern Iowa: Two years of science which can include general science, biology, chemistry, or earth science.

Private colleges, in general, have requirements similar to those of The University of Iowa and Iowa State University.

Current Program Description

The study of science in the Des Moines Public Schools is directed toward four broad outcomes (1) preparing students to use science to improve their own lives and to live in an increasingly technical world; (2) preparing students to deal responsibly with science-related societal issues, (3) acquiring academic knowledge for the pursuit of science related careers; and (4) acquiring academic knowledge of science for application in areas typically identified as non-science careers.

These outcomes represent some shift in emphasis from previous years. Greater emphasis is being placed on societal and technology issues related to the first two broad outcomes.

National Education Goal

American students will be first in the nation in science and mathematics by the year 2000.

Science Education Goals and Objectives

The goals and objectives which direct the Des Moines K-12 program are:

1. The student will be able to apply basic scientific principles, problem solving, inquiry processes and technological knowledge.

    1.1 To provide more classroom opportunities for applying basic scientific principles, problem-solving, inquiry processes and technical knowledge.

2. The student will possess scientific knowledge, skills, and values that will be both useful in making personal decisions and in enhancing long-term employment prospects.

    2.1 To provide more classroom opportunities for decision-making.

    2.2 To provide more examples of the application of scientific principles so that greater awareness of relevancy exists.

3. The student will be able to participate intelligently in making social and political decisions involving science and technology.

    3.1 To provide information that illustrates political and societal consequences of technological advances.

    3.2 To involve students in decision-making that affects society.

4. The student will have an increased level of curiosity, creativity, appreciation, and enthusiasm for science.

    4.1 To provide activities that physically and mentally involve the students in science.

5. The student will have increased concern for conservation of our limited natural resources.

    5.1 To provide activities that cause awareness of environmental concerns.

    5.2 To provide activities that involve students in environmental concerns.

6. The student will be able to use the conventional language, instruments, and operations of science.

    6.1 To increase the utilization of hands-on science so that students are involved both mentally and physically.

7. The student will value scientific knowledge for its aesthetic contribution to his/her continuing personal experience.

   7.1 To identify areas of special scientific interest to students.

   7.2 To include learning that students perceive as relevant to them.

8. The student will, regardless of sex or ethnic origin, have the opportunity for success and achievement in science.

   8.1 To provide material and instruction that is non-sexist and multicultural.

   8.2 To cause greater participation in science courses, especially those of advanced level, by minority students and females.

Planning, implementing, and evaluating are being done with the above goals and objectives in mind. The goals and objectives are being addressed using the K-12 curriculum listed below.

Curriculum Description Summary

Elementary Science

Student learning in elementary science is accomplished using hands-on materials from modules or kits and teaching specific environmental objectives. No textbooks are used; however, science trade books have been added to grades K through five. These trade books supplement and enrich the hands-on program. The adopted program provides a balance of study in the life, earth, and physical sciences. The program, by grade level, is:

Kindergarten	Explorations in Science and Mathematics, and environmental objectives
Grade one	Science in the Toy Box and New Plants, and environmental objectives
Grade two	Animal Hall of Fame and Air and Weather, and environmental objectives
Grade three	Structures of Life, Earth Materials, and Measurement, and environmental objectives
Grade four	Water, Electric Circuits, Pond Life and Pill Bugs, and environmental objectives
Grade five	Powders and Crystals, Landforms, and Levers and Pulleys, and environmental objectives

Middle School Science

The middle school program consists of three grade-level courses which are designed to provide students with a broad background knowledge in science.

Each grade level course covers and expands on six themes. The themes are energy, evolution, patterns of change, scale and structure, stability, and systems and interactions. The themes are intended to integrate facts and ideas. They create a framework for the unification of the different scientific disciplines.

The program is designed to:

- •demonstrate interrelationships among science, technology, and society
- •improve communication skills
- •create greater concern for the environment
- •develop higher-order thinking skills
- •improve social skills
- •teach important science concepts, processes, and ideas
- •improve the ability to solve problems and apply scientific principles.

High School Science

Science courses common to all high schools are Earth/Space science, Biology, Chemistry, Physics, Applied Science, and Introduction to Chemistry and Physics and Biology II. Two schools have courses unique to the school. Roosevelt offers Advanced Chemistry and Lincoln offers Botany, Zoology, Environmental Science, and Conceptual Physics.

High school science offerings are similar to those listed in the 1993 program evaluation. Applied Science was added to the curriculum in the fall of 1990. One semester of this course includes units on personal health, human development, survival skills and health careers. The other semester includes units on the environment, weather, and technology.

Science courses offered at Central Campus are Earth Science, Marine Biology, Advanced Placement (AP) Biology, Advanced Placement (AP) Chemistry, and Advanced Placement (AP) Physics.

The course descriptions for the high school program are in the District Curriculum Guide which is on file in the Teaching and Learning Division. Course objectives and courses of study are also on file in the Teaching and Learning Division.

Special Programs

Science Bound

Science Bound is a program developed in conjunction with Iowa State University and funded through grants. There are one hundred sixty-eight students are presently participating. Its purpose is to increase the interest and enrollment of minority students in high school science and math with an ultimate goal of having more minority students choose careers in science, engineering, or mathematics. It is in its seventh year. Five minority students from each middle school are identified each year for participation, beginning at the eighth grade. Selection is based on high ability, but under achievement. During the eighth grade, these students are taken to Iowa State University once each month for special programs. They also participate in class presentations, and meet periodically with mentors from businesses and industries. They take an overnight field trip each year to the Conservation Education Center at Springbrook State Park. An enrichment program in mathematics is provided for students in the summer. As they progress through high school, they receive encouragement and assistance through visitations of professors from Iowa State University and take field trips to Iowa State University. They visit businesses and industries, work with teachers and mentors, and participate in clubs.

Last spring was the first year for seniors to complete the program. In the fall of 1996, nine Science Bound Students enrolled at Iowa State University. The approximate cost of this program is $1000/student/year, covered by grants received by Iowa State University.

High School Science Course Fall Enrollments

Course	1990	1991	1992	1993	1994	1995	1996
Applied Science	591	592	543	585	385	432	443
Earth/Space Science	862	1097	1431	1595	1320	1333	1512
Biology	1256	1241	1649	1639	1551	1424	1542
Intro Chem/Physics	164	213	178	182	175	159	147
Chemistry	564	709	819	913	887	758	887
Physics	395	354	447	505	441	472	580
TOTAL	**3832**	**4206**	**5067**	**5419**	**4759**	**4578**	**5111**

Central Campus Science Course Fall Enrollments

Course	1990	1991	1992	1993	1994	1995	1996
Physics/Chem Princ.	46	49	57	39	64	69	50
AP Biology	28	36	41	42	53	40	58
AP Chemistry	17	14	42	37	32	26	28
AP Physics	15	23	9	18	32	17	16
Marine Biology*	65	65	80	65	66	74	72
TOTAL	**171**	**187**	**229**	**201**	**247**	**226**	**224**

*Many marine biology students are enrolled two periods each day.

The charts above illustrates a significantly larger science enrollment in the regular high schools in 1996 than in the previous two years. The increase in physics enrollment is especially encouraging. Enrollment in AP courses has been relatively stable; however, the enrollment in AP biology is the highest ever this year.

Seniors Completing Various Years of Science

Below is a summary of the data showing the percent of 1996-97 seniors completing or enrolled in the different number of years of science.

	East*	Hoover	Lincoln	North*	Roosevelt
One year only	17.6	16.7	17.3	26.4	8.4
Two years only	32.8	20.4	17.3	28.6	16.4
Three years only	30.0	25.7	33.7	20.8	40.2
Four years only	16.7	31.4	27.3	21.2	28.7
Five years only	2.8	5.7	4.3	3.0	6.3
Two years or more	82.4	83.3	82.7	73.6	91.6

*Self-contained special education students excluded from the data.

The percentage of students completing two or more years of science in 1992:

East, 55% Hoover, 84% Lincoln, 68% North, 65% Roosevelt, 82%

The 1992 data included all students for all high schools. These data indicates more students presently taking two or more years of science at East, Lincoln, North, and Roosevelt than in 1992.

Past Needs

The needs identified in the 1993 program evaluation were:

- a two year science requirement for all students
- written science objectives all students would be expected to meet by graduation
- additional staff development, especially in technology and alternate forms of assessment
- additional allocation of resources to science
- additional technology and computerized labs
- improved science facilities
- basic safety items in each classroom

Program development and modification has been based on meeting these needs.
This is described on page 30.

INPUT EVALUATION

Budget and Sources for Revenue

Money to support the science program comes from the following sources:

- Elementary science consumable budget
- Secondary building budgets
- Student fees for consumables
- Curriculum development budget
- Textbook budget
- Eisenhower funds
- Grants

Elementary Science Consumable Budget

Funds from this budget are used to replenish the consumables used in the elementary science program. The consumables include items such as light bulbs, seeds, live materials, soil, and clay. The budget for 1996-1997 is $15,149 for 42 elementary schools.

Secondary Building Budgets

Building budgets for science vary considerably among buildings and are determined by the principal. These funds are used to purchase science materials and equipment. Building budget funds are sometimes supplemented by special funds from other sources or budgets. This causes the listed funding to be quite misleading. Often Parent, Teacher, Student Association (PTSA) funds are used to purchase additional equipment. Budgets by building are:

School	School Budget	Student Fees	Total
East	3,950	6,490	10,440
Hoover	3,600	5,100	8,700
Lincoln	5,100	8,081	13,181
North	1,000	3,483	4,483
Roosevelt	5,000	6,700	11,700
Central Campus	4,130	5,655	9,785
Scavo	300	--	300
Casady	250	250	500
Brody	100	4,080	4,180
Callanan	500	2,930	3,430
Goodrell*	4,000	--	4,000
Harding*	300	3,595	3,895
Hiatt*	1,500	--	1,500
Hoyt	600	2,200	2,800
McCombs	400	2,500	2,900
Meredith	2,500	3,087	5,587
Merrill	600	2,500	3,100
Weeks	350	1,800	2,150
TOTAL			$91,631

*lab fees not separated

Student Fees

Student fees are for replacement of consumable items used in the science program. Fees for this purpose are only collected from middle and high school students. Science course laboratory fees for 1996-97 are*:

Grade/Course	Amount
Grade 6	5.00
Grade 7	5.00
Grade 8	5.00
Earth Science	5.00
Biology	7.00
Intro to Chem/Physics	5.00
Physics	5.00
Chemistry	7.00
Applied Science	5.00
Biology II	10.00
AP Biology	20.00
AP Chemistry	10.00
AP Physics	6.00
Marine Biology (1 hour class)	40.00
Marine Biology (2 hour class)	35.00
Physics and Chem. Princ.	10.00

*Fee waivers are available in some cases.

Curriculum Budget

Curriculum funds are used to pay instructional staff to select textbooks or develop curriculum. The budgets were: 1993-94, $8,281; 1994-95, $4,771.50; 1995-1996, $4,090; 1996-1997, 0.

Textbook Budget

Funds from this budget are used to purchase instruction materials. The expenditure for science from this fund in 1993-94 was $61,693.78. The expenditure for science for 1994-95 was $306,296.39. The expenditure for 1995-96 was $165,958.91.

Eisenhower Funds

Eisenhower funds are federal funds provided to the state for dispersement. Their use is restricted to staff development related projects. Almost all staff development in science is funded using Eisenhower funds. These funds have increased over the past three years.

Year	Amount
1993-94	$49,594.92
1994-95	$49,288.28
1995-96	$55,040.98

Grants

Various grants have been received between 1994 and 1996. These have provided technology, additional teacher training, improvements in equipment, and enhanced student learning. They were received either by the district, teachers, or state universities. These grants included:

Resource Enhancement and Protection (REAP):
This grant provided $6,019.00 for a Life on the Prairie staff development class offered at the Conservation Education Center at Springbrook State Park.

Eisenhower
This $5,000 grant was awarded to pay demonstration classroom teacher in mathematics and science. Other district teachers visited identified classrooms to observe certain instructional methods.

Institute for Physical Research and Technology through Iowa State University
This grant provided $125,000 in 1995-1996 for the Science Bound Program.

U.S. West through Iowa State University
This grant provided $4,000 in 1995-1996 for the Science Bound Program.

Professional and Scientific Council at Iowa State University
This grant provided $600 in 1995-1996 for the Science Bound Program.

National Science Foundation Grant through the University of Iowa
A portion of this $2.3 million dollar, three-year grant is used to fund several of our teachers in a program called Scope, Sequence, and Coordination. Middle and High School teachers in this program receive training in ways to increase student interest in science.

Star Schools Grant Program through Iowa State University
A portion of this $199,960 grant funds one of our chemistry teachers and chemistry teachers in three other districts to develop a technology-rich, supplemental chemistry curriculum in a project called the Iowa Chemistry Education Alliance.

U.S. West Foundation through Iowa State University
A portion of this $479,753 grant funds four of our teachers to participate in the Davinci Project. This project brings science and art teachers together to develop an interactive multimedia system that integrates art and science. Participants received a computer as part of the grant.

Carver Grant
This $5,000 grant provided funds for the development of a nature center at Goodrell.

U.S. West Technology Grant and Toyota Grant
A $10,000 grant from U.S. West and a $12,000 grant from Toyota received by Central Campus provided funds to merge academics with vocational technology through the development of an aquaculture program.

National Dutch Bulb

The grant provided $400 worth of tulip bulbs and related materials to use with the Callanan nature area.

EPA Grant

This grant provided $5000 to North High School for a project called WOW (Watching Our Water). This grant provided funds for water quality testing equipment to be used by Science Bound students in a project to test the water quality at Riverview Nature Island.

Roy G. Carver

The purpose of this $5,000 grant was develop interdisciplinary (world history, math, and earth science) multimedia lessons. Included in the funding was a Macintosh 7600 AV computer.

National Gardening Association

This grant provided approximately $300 of gardening tools to a teacher at Stowe Elementary to use in a garden project.

Trees Forever

This $1,200 grant was received by a teacher at Lincoln to be used for trees in a nature area behind Lincoln High School.

Iowa Space Consortium

This grant provided $500 to purchase a laser disc and video tapes to use with a space unit in earth science at Lincoln.

Kodak Grant

This grant supplied the Hoover chemistry department with $5,000 to purchase 2 DC-50 digital cameras and supplemental equipment and write innovative curriculum for chemistry.

Human Resources Cost 1995-96

No. of	Middle and High School Position	Cost Including Benefits
563	Elementary Teachers	$ 2,351,593.27
98.5	Secondary Teachers	4,646,345.47
5	Associates	94,756.00
.5	Secretary	27,884.00
1	Supervisor	82,351.97
	Total	$ 7,202,939.71

Teacher's salaries are based on the percentage of grade level allotted time for science and the average teacher's salary of $37,055 plus benefits of 27.3%. Associates salaries are based on actual salaries and benefits. The secretary's salary is based on half-time actual salary plus benefits.

District Instructional Materials
Textbooks In Use

Course	Title	Copyright	Use Period	Cost Per Module or Book	Total Cost
Elementary					
K	Early Explorations	1992	93-02	$429.25	$31,043.25
K	Various tradebooks	vary	93-02	vary	4,214.88
1	Science in the Toy Box	1995	95-02	249.00	18,177.00
1	New Plants	1992	95-02	462.75	33,780.75
1	Learning Center Items			108.04	13,505.00
1	Various tradebooks purchased	vary	95-02	vary	5,912.50
2	Animal Hall of Fame	1995	95-02	248.00	18,104.00
2	Air and Weather	1992	95-02	472.25	34,002.00
2	Learning Center Items			26.84	3,489.20
2	Various tradebooks purchased	vary	95-02	vary	7,485.00
3	Structures of Life	1992	93-02	260.10	16,646.40
3	Measurement	1992	93-02	512.10	32,774.40
3	Earth Materials	1992	93-02	269.10	17,222.40
3	Various tradebooks purchased	vary	95-02	vary	6,781.25
4	Electric Circuits	1987	93-02	268.00	retained from prior adoption
4	Pill Bug Project/Pond Life	1992	93-02	50.00	3,000.00
4	Water	1992	93-02	395.10	23,706.00
4	Various tradebooks purchased	vary	93-02	vary	7,348.75
5	Powders and Crystals	1987	93-02	225.00	retained from prior adoption
5	Levers and Pulleys	1992	93-02	449.10	28,165.00
5	Landforms	1992	93-02	512.10	32,262.30
5	Various tradebooks	vary	93-02	vary	9,386.25
				TOTAL	**$347,006.33**

District Instructional Materials
Textbooks In Use

Course	Title	Copyright	Use Period	Cost Per Module or Book	Total Cost
Middle Sch.					
6-8	SciencePlus	1993	95-03	$43.95	$128.385.71
6-8	Technology with adoption				142.343.87
6-8	Software with adoption				35.553.81
				TOTAL	$306,283.39
High School					
	Glencoe Health.				
	Harcourt and Brace	1989	90-98	$25.80	$19.711.20
	General Science	1989	90-98	27.27	21.385.17
	Human Anatomy and Physiology	1990	93-01	54.00	6.480.00
	Microbiology, Principles and Applications	1993	93-01	48.00	5.760.00
	Genetics - A Human Perspective	1992	93-01	38.00	4.560.00
	Modern Biology	1993	93-01	36.99	61.033.50
	Biology	1989	92-00	49.56	2.955.60
	Chemistry. The Central Science	1991	93-01	51.75	2.587.50
	Chemistry. The Study of Matter	1992	94-02	38.47	33,622.78
	Prentice Hall. Earth Science	1991	91-98	26.47	40.975.56
	An Introduction to the Biology of Marine Life	1992	93-98	44.50	3,782.50
	NASDA (Scuba Diving)	1992	93-98	35.00	840.00
	Prentice Hall Physical Science	1988	88-98	24.47	7,142.10
	Conceptual Physics	1992	92-99	34.50	5,692.50
	Physics, Principles and Problems	1992	92-99	35.49	19,554.99
	College Physics	1992	94-02	48.25	1.930.00
				TOTAL	$218,458.41
				TOTAL FOR ALL LEVELS	$871,748.13

Textbooks Scheduled for Examination and Purchase in 1997

Course	Estimated Cost
Zoology*	$1700
Botany*	$1700

*These one semester courses are offered only at Lincoln.

Staff Development Costs

Staff development in science is provided using Eisenhower Funds. These funds pay for substitutes, released time, convention travel costs, and materials related to staff development. The total cost of the various programs matches funds received stated on page eleven.

New Equipment in Use

Science modules were purchased for grades K, 3, 4, and 5 in 1993 and for grades 1 and 2 in 1995. The purchases included trade books for all elementary grades and learning center items for grades one and two. Six cases containing eight elementary microscopes were purchased for routing to schools. Routing is handled by the media center. These allow students to investigate the microworld, especially in pond water.

For secondary, purchases were through building budgets. Other than technology, new equipment purchases were limited to a three microscopes at Brody and one at North, and a magnetic stirrer at Weeks.

New Technology in Use

The middle school curriculum adoption included the purchase of the following technology: 29 computers, 20 printers, 6 external CD-ROM's, 6 LCD's, 6 overheads to use with the LCD's, 12 TV's, 23 VCR's, 13 laser disc players, and one video microscope system. Fifteen different software programs were also purchased.

Purchases from grants, building funds, or demonstration school funds for secondary schools included the following: 14 computers, 2 VCR, 3 videocameras, 2 laser disc players, 1 TV, 1 personal science laboratory, 1 modem, and 1 document camera.

Community Resources

The education of our students is enhanced through the use of community resources. This includes the use of guest speakers from many organizations and field trips to a variety of sites. Schools make arrangements for the guest speakers and many of the field trips. Field trips, arranged for and scheduled by the district, have been:

Science Center

A microscope outreach program for fourth grade students assists in the study of pond life.

Seventh Grade students participate in the Challenger Center experience where they take part in a simulation of Mission Control and a space flight.

Zoo

Seventh Grade students attend the zoo as part of their science course.

Botanical Center

The majority of our K-3 elementary students take advantage of the Botanical Center Field Trip made available on an optional basis each year.

Other Community Resources

Other community resources provide field trip experiences, guest speakers, and/or curriculum materials.

These community resources include the Department of Natural Resources, Polk County Conservation Commission, Metro Solid Waste Agency, Water Works, Drake University, Grandview College, Des Moines Area Community College, Iowa Methodist Medical Center, Iowa Lutheran Hospital, Mercy Medical Center, Des Moines General Hospital, Broadlawns Medical Center, Poison Control Center, Polk County Health, American Red Cross, Police Department Crime Protection, American Lung Association, Our Primary Purpose, American Cancer Association, Midwest Power, Riverview Nature Island, various parks, and the Dairy Council.

Field trips taken last year that have been outside of the district

Fossil hunting at Pella, the dinosaur exhibit at Iowa City, the Omaha Zoo, Iowa State University, Walnut Creek Environmental Site, Kansas City Worlds of Fun Physics Day, Y-Camp at Boone, Red Rock to view Eagles, Kuehn Conservation Center, Springbrook Conservation Center, Marine Biology trip to Florida, Marine Biology weekend trip to Chicago, the Russian Exchange, the Earth Shuttle trip to Epcott, Busch, Kennedy Space Center.

Allotted Instructional Time for Elementary Science

Time allotments for elementary science are decided by the district. Science is designated to be taught for 13.5 weeks during the year. The allotted time for science during the 13.5 weeks is:

K	185	min/week
1	315	min/week
2	290	min/week
3	225	min/week
4	225	min/week
5	225	min/week

K-2 Integrated Units were developed in 1989. These units integrate science, social studies, and language arts.

A committee is reviewing the time allotments at the present time.

PROCESS EVALUATION

Work-Flow Information

Supervisor Organizational Tasks

The organizational tasks to be performed by the Science Supervisor include planning, implementing, and evaluating processes that will more effectively cause greater student awareness, comprehension and application of scientific knowledge.

Organizational Relationship

The Science Supervisor reports to the Associate Superintendent for Teaching and Learning and receives guidance from the Executive Director of Middle and High School Programs and the Executive Director of Elementary and Early Childhood Programs. He supervises the science program K-12. As the district Chemical Hygiene Officer, he reports to the Director of Facility Management.

1996-1997 Objectives of the Science Supervisor

WEIGHT (%)	OBJECTIVE
50%	1. Facilitate instruction by -- a. maintaining an effective delivery system for materials, equipment, and information. b. providing technical assistance c. keeping abreast of science curricular developments. d. evaluating for improvement of instruction.
10%	2. Ascertain needs and promote curricular modifications that increase student interest, enthusiasm, and performance.
15%	3. Support the missions and objectives of the district.
15%	4. Assist in planning and/or delivering appropriate staff development programs.
10%	5. Provide for a safe learning environment by -- a. insuring that the staff is well informed on safety procedures. b. remaining knowledgeable of properties and hazards affiliated with the equipment and chemicals used in the classrooms. c. informing personnel of safety concerns existing in each building. d. implementing the chemical-hygiene plan.

Summary of District Improvement Plan Goals

The 1996-97 District Improvement Plan included the goal to have 80% of elementary, middle and high school students achieve at least 70% mastery on all district criterion referenced assessments.

1996-97 Building Objectives Which Impact Science

King

Math/Science and Technology Integration; upgrade with state of the art technology.

Watrous

By May of 1997, 70% of Watrous third graders will score above 70% on science objectives-based tests.

Perkins

Make our magnet program more effective and more attractive to parents and students.

Hoyt

The Hoyt staff will develop and teach at least one additional science/technology based interdisciplinary unit and demonstrate knowledge and use of a networked teacher workstation during the 1995-96 school year.

Staff Development/In-Service Activities

Determination of Staff Development and In-Service Activities

Staff development and in-service activities are determined through surveys of the staff at the fall orientation meeting, at advisory board meetings, and through informal discussions with staff. The staff development programs include workshops and staff development courses.

1993-1996 Staff Development and In-Service

Eisenhower funds were used to fund the staff development programs for science teachers. These funds also pay for teachers to attend conferences and workshops, as well as for materials related to the workshops or inservice.

1993-94 Staff Development and In-Service

In-service programs included Prairie Plant: Uses and Legends; Objectives, Assessment, 70% Mastery; Weather/Climate; Sixth Grade Interdisciplinary Unit; Grade Five Science Feedback and Hints; Designing Interdisciplinary Units; Astronomy-Using the Resources; Science·Plus Pilot; Hot Wheels Physics; Grade Three Science Feedback and Hints; Project Atmosphere Update; Environmental Education Opportunities at Walnut Creek; Grade Four Science Feedback and Hints.

Staff development classes offered included Concept Mapping, Rainforest, Geology of Des Moines, and Life on the Prairie.

Workshops included a one-day session for chemistry teachers, Weather II (offered twice), Butterflies and Peeper Frogs, Concept Mapping, Windows on Science, Hypercard, and FOSS for Elementary Teachers.

Eleven teachers attended the National Science Teachers Association Convention, one teacher attended the American Association of Physics Teachers Convention, thirty-one teachers attended the Iowa Academy of Science Convention, one teacher attended the National Biology Teachers Convention, and two teachers participated in the Russian Science Exchange.

1994-95 Staff Development and In-Service

In-service programs included Integrating English, Math, and Science Using Scaling; Research Affecting Teaching and Learning of Science; Aerospace Education for the Elementary Science Teacher; Graphing in Math, Science, and Social Studies; Space Science in the Secondary Classroom; Hands-on Environmental Education for Lower Elementary; The New Middle School Science Adoption; Space Spinoffs; Our Future in Space; Easy Alternative: Pet Centers to Incorporate; The New Second Grade Science Curriculum; The New First Grade Science Curriculum; The Geology of Des Moines; Bioethics; Using the Graphing Calculators to Solve Physics Problems.

Staff development classes offered included Project Atmosphere; Life on the Prairie, Spring; Life on the Prairie, Fall; and Geology of Des Moines.

Workshops included a four-day summer workshop for middle school science teachers, four one day workshops for grade one and two elementary teachers.

Fifteen teachers attended the National Science Teachers Regional Conference in Minneapolis, four teachers participated in the Russian Science Exchange, five teachers attended the National Biology Convention, thirty teachers attended Iowa Academy of Science Convention.

1995-96 Staff Development and In-Service

In-service programs included Geology of Des Moines; Computer Teleconferencing with PSI Net; Articulation of Science; Videodiscs in the Classroom; Painted Lady Butterflies; Hypermedia, Classroom Tool for Today; Tagging of Monarch Butterflies; Fifth Grade Card Sort; Hands-on Science, Culture and Ethnicity; Making Abstract Easy-Cartoon Science; Prairie Learning Center; Bananos Botas Y Biodiversad; The New First Grade Science Curriculum; The New Second Grade Science Curriculum; Reviewing the K-8 Science Program; Sharing Session for Biology; Geology of Des Moines; Eco Spies in the City; Earth Science-Take the Boredom Out; Elementary Science.

Staff Development/In-Service Activities

1995-96 Staff Development and In-Service

Software; Sixth Grade Science Sharing Session; Eighth Grade Science Sharing Session; The Rain Forest of Belize, third grade science content, fourth grade science content, fifth grade science content.

Three science staff development classes were offered during the year. They were Life on the Prairie, Fall; Life on the Prairie, Spring; and Geology of Des Moines.

Five workshops were done in the summer of 1996. These included a four day middle school science workshop, a five day workshop for physics teachers, a science content workshop for third grade teachers, a science content workshop for fourth grade teachers, and a science workshop for fifth grade teachers.

Twenty-five teachers attended the Iowa Academy of Science Convention, twenty-five teachers attended the National Science Teachers Convention, and four teachers attended the National Biology Teachers Convention, and one teacher participated in the Russian Science Exchange.

Restructuring District Assessment in Science

District science tests in all areas and levels have been, or are in the process of being revised in order to assure closer alignment of critical objectives and test questions. The new tests are module based rather than semester or year end in order to provide for reteaching, as well as for grading and district evaluation. Tests for middle school and earth/space science are being piloted this year.

Staff Meetings

Advisory science committees were formed for elementary, middle, and high school. Periodic advisory meetings were held each year. These meetings served the purpose of receiving input, discussing needs, and disseminating information.

Influence of Technology on Science

Technology is impacting instructional methods, eliminating student misconceptions, reducing student time for analysis of experimental results, increasing communication, causing greater visual awareness and understanding, and providing quicker and more thorough assessment. Examples of available technology and its use are:

- •National Geographic Kids Network, used at five elementary schools, which allows students to communicate about pets and acid rain with students around the world
- •software programs, especially at the technology pilot schools, which enable teachers to provide either direct or individualized simulated trips to the woods and seashore.
- •computers, laser disc players and software at the middle schools which emphasize higher order thinking through the use of programs such as Science Sleuths, the Great Ocean Rescue, and the Solar System Rescue.
- •electronic balances, used in our chemistry labs, which speed up the process of weighing and provide greater accuracy.
- •the CASL system, used at four schools, which interface the balance with the computer and, by comparing student results with expected results, forces students to conduct their laboratory experiments more carefully as it checks and records their results.
- •the videomicroscope which provides visual images on a monitor or TV screen and helps assure that students are observing and interpreting intended structures or behaviors.

PRODUCT EVALUATION

Accomplishments

Providing a science program which provides the opportunity for all students to explore, discover, and learn background knowledge, skills, and values of science is the basis for decisions related to purchases, staff development, and program changes. During the last three years the K-8 science program has been replaced with a theme-based, hands-on program that increases the involvement of students in discovery and experiential learning. The program places greater emphasis on problem solving, improving communication skills, and societal issues. Teacher technology workstations were added to the middle school classrooms. These provide visuals for greater comprehensive and pose problems which develop higher order thinking skills. Several workshops were conducted during the summer and a wide variety of inservice programs were offered during the school year. These acquaint teachers with new programs, new assessment techniques and greater knowledge. New courses of study were written for almost all areas and modular tests were either written or are in the process of being written for grades 3, 4, 5, 6, 7, 8, earth/space science, biology, chemistry, and physics.

Results have included higher enrollments in physics, higher percentages of students taking two or more years of science, greater percentages of minorities and females enrolled in science, changes in teaching styles, greater use of technology, and safer classrooms.

Strengths

The greatest strength in science is the staff. They continue to demonstrate concern for students, participate in staff development, and stay current on recent trends in science education. Ninety six percent of the middle school science teachers attended the five day summer workshop in 1995 and 80 percent attended the summer workshop in 1996. Summer workshops for grade 3, 4, 5 teachers, held last summer, were full at twenty-five participants in each workshop. The applications to attend conferences and conventions exceeds our ability to meet for their requests. In the last two years, one science teacher has received a doctorate, seven have received master's degrees, and others continue to attend college during the summer and throughout the school year.

The dedication of the staff to the Science Bound program for minority students is especially noteworthy. Staff members involve students in a wide variety of activities including a weekend experience at Springbrook Environmental Education Center each spring. Teachers meet monthly to plan activities they will use in their after school program with Science Bound students. This program undoubtedly is partially responsible for the increased minority enrollment in science courses.

Another strength is the willingness of teachers to share. Sharing sessions for Chemistry, Physics, Earth Science, Biology, Life Science, and Physical Science were held during the District In-Service and at various times during the school year. During these sessions teachers share what works and how improvements can be made.

Deficiencies

Achievement on many district criterion-referenced tests, especially at the high school level, is below 70% scoring 70% or higher. Greater emphasis is being placed on teaching to the critical objectives. The introduction of module tests is an attempt to provide teachers with immediate feedback so they can revisit concepts where students demonstrate lack of understanding. Previously test data were obtained at the end of the semester or school year. The value of these data were limited to grading purposes and district evaluation.

The percent of students achieving above 70% has increased compared to when semester or year-end tests were given, but is still not at the district goal level.

A deficiency stated in the 1993 report was the rather low comfort level of many elementary teachers for teaching science the activity-based science program. This was evident from a survey of elementary classroom teachers. Although this concern still exists, classroom observations and comments from teachers indicate the new teacher's guides, training videos and staff development activities have reduced this anxiety considerably.

Teachers voice a strong need for additional training in technology and time to receive this training. Science teachers not only need to learn word processing, they need to become familiar with laser discs, videomicroscopes, multimedia, interfacing with probes, and various other uses of technology. Relating frames on laser discs to the curriculum takes time. Learning Hypercard and using it to develop a lesson takes time. Finding the time to fully utilize the technology is a major problem. Staff development has been offered on the use of the laser disc, interfacing and multimedia. These offerings will continue.

ITBS Results

Revision in the The Iowa Tests of Basic Skills tests made it appropriate to administer the tests to sixth and seventh grade students during 1995-96, as the tests now reflect a closer correlation to the curriculum taught by the district. Using national student norms sixth grade students scored at the 54th percentile and seventh grade scored 53rd percentile. Scores indicate that the average of students in both grades was above grade level.

District Test Results

The percent of students achieving at or above the 70% mastery level on criterion referenced tests for grades 3-5 ranged from 65.4 to 84.5. Over 70% of the students achieved above the 70% mastery level on six of the nine elementary module tests. (See appendix A for mastery levels on each module.)

New criterion referenced tests were written in 1994 and 1995 for biology, chemistry, and physics. The percentage of all students achieving at the 70% mastery level on these tests range from 40.3 to 74.1, depending on the module. New module earth/space science and middle school science tests were written during the 1995-96 school year and summer of 1996 and are being piloted during this school year. The percent of earth/space students achieving above the 70% mastery level in 1995-96 was 17.4. These scores are based on a test that has been in place several years. The new tests more closely parallel critical objectives in each course and higher mastery levels are expected in the future. (See appendix A for mastery levels.)

District comparisons of 1995-96 test results to 1993-94 and 1994-95 are shown below for grades or courses where pilots were not under development or where tests were administered for the first time:

		District Average (Percent)		
Grade/Course	Module/Test	1993-94	1994-95	1995-96
3	Structures of Life	79	77	77
3	Measurement	66	75	71
3	Earth Materials	70	71	72
4	Electricity	69	73	75
4	Water	77	80	73
4	Pillbug/Pond Life	73	74	73
5	Landforms	71	72	71
5	Levers/Pulleys	66	80	79
5	Powders/Crystals	77	80	79
Earth/Space Science	Year-end test	55	56	57

Minority Enrollments

Increases of minority enrollments in science have occurred since the last Program Evaluation Report which was based on 1993 enrollment figures.

Fall Minority Enrollment (as percent of total enrollment in each course)

	Afr. American			Hispanic			Other Minority			Total Minority			Non-Minority		
Course	1989	1992	1996	1989	1992	1996	1989	1992	1996	1989	1992	1996	1989	1992	1996
Earth/Space	5	9	15	1	4	4	4	4	7	10	17	27	90	83	73
Biology	8	11	12	2	3	3	5	6	7	15	19	22	85	81	78
Chemistry	4	9	9	2	1	2	8	8	9	14	18	20	86	82	80
Physics	4	7	5	2	1	5	6	9	9	12	17	19	88	83	81
Bio II*	–	–	6	–	–	.2	–	–	6	--	--	12	--	--	88
AP Biology	0	0	.2	0	0	.2	4	14	3	4	14	19	96	86	97
AP Chemistry	0	5	11	0	0	.4	8	5	4	8	10	14	92	90	86
AP Physics	0	0	0	0	0	0	0	0	-0	0	0	0	100	100	100

*data was not disaggregated for Bio II in 1989 and 1992.

The district minority percentage was 18.0% in 1989, 20.4% in 1992, and 24.1% in 1996.

Female Enrollments

Enrollments of females in science have increased in earth/space, chemistry and physics and decreased in biology, applied science, AP biology, AP chemistry, and AP physics compared to 1992.

Female Enrollment (Percent)

Course*	Fall, 1989	Fall, 1992*	Fall, 1996
Earth/Space	45	48	55
Biology	52	54	50
Chemistry	51	49	55
Physics	42	45	52
Applied Science	not offered	46	43
AP Biology	not available	44	40
AP Chemistry	not available	51	36
AP Physics	not available	44	25

*The percentage of female students in the district in 1996 is 48.9%.

The chart above shows a higher percentage of girls, than the district percentage of girls, are taking earth science, biology, chemistry, and physics. The percentage is considerably lower, however, in the AP courses.

Facility Improvements

During the last three years a few changes have been made in science facilities throughout the district. The facility changes were:

School	Project
Brody	Two TV's were mounted in each science classroom.
Callanan	New tables were added to one science classroom.
Harding	One TV was mounted in each science classroom.
Hiatt	One TV was mounted in each science classroom.
Hoyt	One TV was mounted in each science classroom.
Meredith	A sink was added to a classroom and TV's were mounted in each science classroom.
Merrill	A classroom was converted to a science classroom. Cabinets, new tables, and a demonstration table were added.
Roosevelt	A new sink and new lab tables were added to one classroom.

These remodeling projects have improved instructional efficiency and enabled greater student laboratory participation.

Improvements in Classroom Safety

In 1991, OSHA introduced new safety requirements which applied to schools. School districts were required to develop and implement a Chemical Hygiene Plan based on OSHA guidelines. The Science Supervisor was designated as the Chemical Hygiene Officer. A plan was developed which requires training in safety for all district craftsmen, custodians, food service workers, substitute teachers, and all teachers of art, science, and career and technology education. It also delineates safety requirements regarding working conditions. Steps have been taken to be in compliance with the Chemical Hygiene Plan. Drench hose/eyewashes and/or safety showers have been added to most science, art, and career and technology classrooms. Safety cabinets for flammable liquids and acid cabinets were added to science, art, and career and technology classrooms where a need has been identified. Stockroom bottles have been labelled with appropriate labels in order to meet OSHA requirements. In order to minimize chances for contamination or accidents chemical inventories have been reduced. Required record forms for training and inspection have been developed and maintained. Steps, such as bi-annual reporting, monitoring of eyewashes and fumehoods, and inventorying, continue to be taken to assure compliance with the Chemical Hygiene Plan.

Awards and Commendations

Several staff members received awards and acceptance at summer programs during the past three years:

Larry Beall--	Who's Who Among American Science Teachers, 1994
Mike Blair--	Iowa Math and Science Coalition Teacher Award, 1995 Chemical Companies Excellence in Science Teaching award, 1995
Sandra Crabtree--	State Presidential Award in Science, 1996
Jerry Ferrell--	Grinnell College Outstanding Teaching award, 1994-95 NSF Chemistry Grant, 1992-94
Sharon Fisher --	State Presidential Award in Science, 1995 and 1996; Chemical Companies Excellence in Teaching award, 1993; National Association of Biology Teachers Outstanding Biology Teacher award, 1993
Ace Hendricks--	Metrowaste Authority Environmental Science Teacher of the Year, 1994
Lisa Horsch--	Who's Who Among Science Teachers,1995
Larry Hutzell--	Who's Who Among Science Teachers, 1994 and 1995
Linda Kuiken--	PTRA award, 1993, 1994, 1995
Lowell Long--	Who's Who Among Science Teachers, 1995
Lori Milligan Powell	STEP (NASA) awardee, 1996
Patti Ralph--	State Presidential Award in Science, 1996
Lyn Shiffler--	Rotary Teacher of the Year, 1994-95
Karen Sievers--	National Presidential Award in Science, 1995; U.S. West Outstanding Teacher, 1995; Fulbright Research in Costa Rica, 1995
Karen Stiles--	Grinnell College Iowa Teacher of the Year, 1993
Susan Stroope--	Tandy Outstanding Teacher award, 1994-95
Karen Wignall--	Tandy Outstanding Teacher award, 1996
Granville Williams--	Kiwanian Teacher of the Year, 1993

Science Teachers Section of the Iowa Academy of Science Positions

The Science Teachers Section of the Iowa Academy of Science holds annual meetings each October. It provides a network for sharing and recognition, keeps membership informed of new initiatives, and conducts special programs for students.

Staff members holding Iowa Academy of Science Positions are:

Marcia Ansevics--	Regional director, 1989-present
Steve Benson--	Earth Science Section Vice Chair, 1995-96; Chair, 1996-97
Jerry Ferrell--	Education Committee member, 1993-96
Sharon Fisher--	Newsletter Editor, 1996-?
Don Perschau--	Finance Committee member, 1995-98
Scott Schoneberg--	Earth Science Section Chair, 1995-96
Karen Wignall--	President-elect, 1996-97

1995-1996 Central Academy AP Performance

Central Academy students continue to score extremely well on AP Science Exams. The chart below indicates the percent of students scoring 3 or higher. A 3 or higher means college credit is recommended.

The Central Academy AP scores:

	Mean Score	Percent Scoring 3 or Higher
Central Academy-Biology	3.03	65
*National-Biology	3.06	64
*Iowa-Biology	3.12	67
Central Academy-Chemistry	3.30	65
*National-Chemistry	2.81	57
*Iowa-Chemistry	3.87	56
Central Academy-Physics B	4.50	100
*National-Physics B	2.77	60
*Iowa-Physics B	3.27	74

* 1995 State and national statistics used; 1996 state and national figures are unavailable at this time. State and national figures, in the past, vary little from year to year.

Survey Results

Attitude survey

In order to ascertain if the new middle school science program affected how students feel about science, six teachers voluntarily gave an attitude survey to a sampling of about 800 students in the fall and again in the spring (see appendix B). Based on the results from these students, there was an increase in the percent of students indicating that science classes are fun, increase my curiosity, deal with information produced by scientists, provide a chance for me to follow-up on questions I have, encourage me to question, and recognize that all people can do science. There was also an increase in the number that responded that science is boring which is inconsistent with the other responses.

Survey Related to the National Standards

In order to ascertain how teachers felt the district compared with content standards described in the National Education Science Standards, surveys were given to groups of elementary, middle, and high school teachers (see appendix C).

This survey indicated that teachers at each level feel that the district provides thorough coverage in the area of science as inquiry. Teachers at all levels scored our coverage as "some" or "thorough" in all areas, but suggested a deficiency in earth and space science at the elementary level.

Middle and High School Staff Survey

A survey given to teachers at the 1996 fall orientation provided responses in several areas:

Question	Most Frequent Responses
Staff development needs?	Internet, other technology, performance assessment, career information for students
How has your instructional style changed?	Using more alternative forms of assessment, using more technology, doing more individualized projects, more teaming, more hands-on, more collaborative learning, more curriculum integration, project homework, more constructivism
What has been the impact of the National Standards?	The new middle school adoption was influenced by the standards, it is a valuable resource, more hands-on
What are the six top needs in the district?	Facility improvement, furniture, equipment, more technology, more student contact time, more community involvement, greater support for field trips, additional staff development, smaller class sizes

Supervisor's Observation

One hundred forty-two visits were made to elementary and secondary buildings last year.

During visits to elementary schools, differences in enthusiasm for science are apparent, but science is being taught more than in the past. Evidence for this is the significant increase in the cost of furnishing consumables for instruction and the nearly 100% module testing in all schools. The enthusiasm is generally greater in those buildings where teachers trade responsibilities for science or social science or where science is still departmentalized. On the other hand, excellent science is being taught in many self contained classrooms. The majority of elementary teachers demonstrate a strong commitment to providing quality investigative science to our students. More teachers are trying different approaches to integrate science with other disciplines.

Middle school teachers are changing instructional styles more than any other group. This can be attributed to the new adoption and to the addition of technology. Changes in assessment methods are most apparent. Journaling, rubrics, concept mapping, and collaborative learning are commonly used. There is a great deal more teaming with integration of curricular areas. More students are engaged in learning. Teachers are challenging students with varied and higher interest problems to solve and are reporting fewer failures. Questioning strategies are emphasizing higher order thinking. Most significantly, teachers are continually searching for better ways to motivate students and teach the content and skills.

Costs versus Benefits

Staffing costs for 1996-97 were $7,202,930.71, instructional costs were $871,748 for an eight year cycle or $108,969 per year, building budgets for materials for one year were $89,357, and staff development costs were approximately $50,000 per year. These provide an estimated annual cost of $7,451,256 or approximately $233 per student.

The needs for improved facilities, technology, furniture, equipment, and smaller class sizes suggest the cost per student should be higher.

Due to the legislative action in the spring of 1996 related to student fees, concern exists over the future of lab fee income which affects building budgets. The district five year plan totalling $500,000 to improve science equipment was reduced each year so the total provided at the end of the five years was approximately $225,000. On the other hand significant technology was purchased through the instructional materials budget. Printing costs are considerable higher but the budget for printing is only slightly higher. The elementary consumable budget will become inadequate as more elementary teachers teach the intended curriuculum.

Safety Records

Safety is a high priority. Annual training sessions on safety have been conducted for all science teachers. One accident in a science classroom has been reported in the last seven years. This one accident resulted in no injuries.

Improvements Based on Needs Identified in the Last Program Evaluation

1993 Identified Need	Improvements
Two-year science requirement	No changes were made.
Science objectives for graduation for all students written	The objectives have been written. High school course modifications and new requirements are needed to meet them.
Staff development	An increase in Eisenhower Funds has made it possible to provide additional staff development. This need still exists especially in the area of technology and alternative assessment.
New technology	New technology was purchased for middle school science classrooms. Little progress has been made in other areas.
Facilities	This is a critical need. Improvements in the last three years, with the exception of one new lab at Merrill, are basically the addition of sinks to a few classrooms.
Safety	Considerable progress has been made. Several secondary science classrooms still do not have water and thus no eyewashes. This is a major concern.

FUTURE PLANNING

Focusing Teaching and Learning

Since the release of A Nation at Risk in 1983 by the National Commission on Excellence in Education, various groups have called for dramatic changes in science education. A new concern for curriculum direction, teaching styles, teacher training, goals, student outcomes and assessment methods has occured. The Project 2061 report by the American Association for the Advancement of Science (AAAS) attempted to set standards. A Nation Prepared, released by the Carnegie Forum on Education and the Economy, dramatized concern. A Time for Results, by the National Governor's Association (NGA) concluded with a goal that "American students will be first in the world in science and mathematics." The Des Moines Public Schools has written a goal that parallels the goal of the NGA.

The National Research Council (NRC), the principal operating agency of the National Academy of Science, coordinated the development of national standards for science education in grades K through 12. The National Science Education Standards was published and distributed at the beginning of 1996. The standards address content, teaching, and assessment and represent the consensus of teachers and other science educators, scientists, and the general public. Needs expressed below partially address the "Standards."

Needs

Two-year Science Requirement

This recommendation is for regular program students. A second year would be voluntary for ESL and special education students. At the present time students may take one year of any of our high school science offerings in order to meet the district requirements. The percentage of students who select only one science course is about 20% (see page eight of this report). Many colleges are dictating that students take a minimum of three lab science courses in high school. Non-college students also need the skills and content available through the science offerings in high school. The data suggests many students are not presently voluntarily enrolling in courses they will need in a technological society. If ESL and special education students are excluded from this recommendation, additional costs would be limited to an additional staff person at two or three buildings. Equipment would, at least initially, have to be shared. Estimated cost $80,000 to $120,000.

Introduction of a High School Introductory (Gateway) Science Course

A committee of high school teachers has written a concise but comprehensive list of fundamental objectives all students should be expected to meet by graduation. In addition a study has been made to determine which of these fundamental objectives are covered by the completion of the eighth grade. This review revealed areas where coverage of certain fundamental science objectives, is lacking or missing, i.e. topics such as atomic structure, heat, light, sound, and energy in the earth system.

The addition of a required introductory (gateway) science course for ninth grade students would address these needs. This course would also address other areas of concern such as as oral communications and writing skills, higher order skills such as problem solving and decision making, affective skills such as responsiblity, team work and self-management, as well as career information and application of technology. It would emphasize hands-on discovery learning and would be designed to meet the needs of students of all abilities.

At the completion of the K-9 program, which includes the gateway course, students would have received coverage of what could be termed the fundamental science objectives. Students would be better prepared for earth/space science, biology, chemistry and physics and would be developing employability skills in the process. Since coverage in the gateway course would include topics from earth/space science, biology, chemistry, and physics, time spent on portions of each of the present courses would be reduced, allowing more time to be spent on other objectives. Passage of the gateway course would be required before other science courses could be taken. Funding of this course would be through the curriculum adoption budget.

Schools would have the option of retaining the present applied science and introduction to chemistry and physics course if they so desired, but it is anticipated that the gateway course would replace these two courses in most schools. The earth/space course would be modified and provide greater coverage in theme areas. Estimated cost $160,000.

Coordination with other curricular areas in career pathways and school to work initiatives

Knowledge of and skills related to science is critical for a high percentage of careers. Initiatives in the development of career pathways or in the development of a comprehensive school to work program requires infusion of career awareness and exploration, greater access to community resources, and a coordination of curricular offerings. Course requirements and/or modifications need to be studied as these programs are implemented.

Curriculum management audit

Although concerns exist with the rating of the course of studies, modifications to meet suggestions will improve the information available to staff. Modifications which should be especially helpful to staff will include connecting objectives to suggested performance and district assessments, suggested pacing and emphasis, restating the prerequisites, and adding suggested activities or instructional processes to address concepts and skills.

Other components of the curriculum management audit will be addressed as the district task forces move address the recommendations. Estimated cost for improving the courses of study is $8,000.

Instructional Conditions

Instruction conditions include availability of materials, equipment, and technology as well as appropriate facilities and time. Hands-on science takes time. It is certainly quicker for the teacher to tell students information than it is for students to discover it. But recall, motivation, and skill development occurs best by involving the students in active learning. The allotted time for science in the elementary grades does not coincide with efforts to improve the quality of learning in science. Allotted times need to be increased to at least be comparable to other similar-sized districts. More efforts will be made toward integrating the curriculum when appropriate.

Shortened periods at the high school level have also made it difficult to complete laboratory activities. Teachers are not covering the material as thoroughly as in the past. Modified or block scheduling needs be examined for future consideration.

Large class sizes in middle and high school science classes, especially in small classrooms make it very difficult to teach the hands-on program expected in our program. Partially due to the limited number of science classrooms in our buildings, science teachers often have the largest teaching load in the building, yet their teaching load includes spending additional time preparing for laboratory activities and maintaining equipment. Safety becomes a major concern in crowded classrooms. A significant portion of these concerns could be met through the passage of Vision 2005.

Use of community resources

Although science probably makes greater use of community resources than other curricular areas, much more should be done. Students benefit and learn from awareness of and participation in their world. Increased involvement in environmental education programs translates to greater care for the natural world.

A great new resource that will be availble to our students beginning next April is the Walnut Creek Wildlife Refuge near Prairie City. The expansive visitor's center on this 5000 acre prairie is near completion. It includes unique exhibits and options for student outdoor and indoor laboratories that will provide wonderful opportunities for our students.

Riverview Nature Island and the Greenwood Pond, are convenient resources that have much to offer in terms of environmental study sites. They are convenient and offer a variety of habitats.

At the present time field trip buses are only available between about 9:20 a.m. and 1:30 p.m.

Support for field trip buses needs to be a higher district priority so that these community resources can be utilized to a greater extent. The budget for field trip needs to be increased by a minimum of $45,000.

Additional Funding for Regular Program

Fee waivers have the potential for lowering income for science up to approximately $80,000 per year. Printing costs have increased more than the budget increase. Consumable costs for elementary science have increased as more teachers teach the activity-based program. The high school science enrollment is higher than in 1994 and 1995 which translates to more use of equipment and supplies. Estimated cost to address these concerns is $100,000.,

Increased Enrollments in Science for Minorities and Females in Upper Level Science Courses

There is a predicted dire shortage of scientists and engineers in the future unless greater interest for careers in science is created among minorities and females. There is a need to continue programs such as Science Bound to promote interest in science. The cooperative effort between colleges and universities to find ways to encourage more minorities and females to enter science will continue.

Staff Development

All teachers have indicated the need for more in-service, especially in the use of technology. Teachers want additional assistance in using multimedia, internet, interfacing, and word processing. Classes or workshops on developing and using alternative assessment is another request of teachers. Teaching methods are changing. Cooperative learning and concept mapping are being successfully used to improve comprehension and understanding. Successes with new teaching styles will be shared and promoted.

Emphasis will be placed on content workshops related to the curriculum for elementary classroom teachers. The continuation of federal support for Eisenhower Funds is critical in order to meet staff development needs. Estimated cost, $55,000 per year (equivalent to the present Eisenhower Funding).

Provisions for upgrading equipment in high schools

Technology has tremendous application to science instruction. Although progress has been made, teachers identify technology as one of their greatest needs. The need is greatest in physics where technology based laboratory activities allow students to obtain and analyse data faster and assist in the understanding of concepts. Microscopes are the major equipment need in several schools. Funding for this will require a major commitment on the part of the district. Approximately $100,000 is needed for microscopes. Outfitting all physics labs with the technology based equipment would require approximately $600,000. A plan for phasing in science labs needs budgetary support.

Assessment of Student Achievement

The materials adopted for elementary have three types of assessment: hands-on, performance, and reflective. This is an excellent model for development at other grade levels and courses. There will be an effort to continue to develop more appropriate assessment tools which include higher order thinking skills. This effort will concentrate at the middle and high schools. Estimated cost, $5,000.

School	Course	% ≥ 70% All Students	% ≥ 70% Females	% ≥ 70% Males	% ≥ 70% Non Minority	% ≥ 70% Minority	N Tested All Students	N Tested Females	N Tested Males	N Tested Non Minority	N Tested Minority
District	Sci 3 Structure of Life	78.5	80.9	76.1	80.9	70.5	1943	986	957	1499	444
District	Sci 3 Measurement	65.5	64.6	66.4	68.7	54.4	1749	874	875	1363	386
District	Sci 3 Earth Material	66.4	69.4	63.4	68.7	58.1	1717	851	866	1347	370
District	Sci 4 Pillbug, Pond Life	84.4	84.9	83.9	86.4	75.9	1720	834	886	1388	332
District	Sci 4 Water	84.5	85.8	83.3	86.8	75.8	2041	992	1049	1612	429
District	Sci 4 Electricity	72.5	72.1	72.8	76.3	57.5	2051	994	1057	1637	414
District	Sci 5 Landforms	67.7	67.8	67.6	71.3	55.5	1884	932	952	1459	425
District	Sci 5 Powder, Crystal	81.1	83.3	79	83	74.8	1972	978	994	1516	456
District	Sci 5 Levers, Pulleys	65.4	62.3	68.5	69.7	51.3	1837	904	933	1408	429
District	CA Earth Science	44	43.9	44	46	29.4	141	66	75	124	17
District	Earth Science	17.4	15.7	19.2	17.7	16.3	975	485	490	767	208
District	Biology M1: Intro & Chem	57.2	54.6	60.6	60.5	42.1	1038	584	454	855	183
District	Biology M2: Cytology	55.2	51.8	59.7	58.5	41.6	1214	691	523	976	238
District	Biology M3: Genetics	41	40.3	42.1	43.3	31.5	1145	648	497	923	222
District	Biology M4: Evolution	73.9	72.1	76.3	77.3	59.5	1188	674	514	961	227
District	Biology M5: Kingdoms	33.8	35.3	31.9	36.9	20.9	1137	629	508	917	220
District	Biology M6: Human Systems	59.2	59.6	58.8	63.4	43.5	1001	557	444	792	209
District	Biology M7: Ecology	70.6	68.3	73.3	74	56.1	1111	616	495	897	214
District	Chemistry Mod 1	74.1	71.1	77.9	76.3	63.5	745	415	330	619	126
District	Chemistry Mod 2	48.9	47.4	50.8	50.1	43.1	707	392	315	591	116
District	Chemistry Mod 3	57.7	53.7	62.6	60.3	43.8	667	365	302	562	105
District	Chemistry Mod 4	44.1	42.4	46.4	45.3	36.9	589	328	261	505	84
District	Chemistry Mod 5	63.9	62.6	65.5	64.8	58.8	582	321	261	497	85
District	Chemistry Mod 6	48.3	45	52.1	48.7	46.2	613	331	282	522	91
District	Physics Mod 1: Forces	57.8	51.1	64.4	57.8	57.8	460	227	233	377	83
District	Physics Mod 2: Work	71.5	64	78.7	70.9	74.1	452	222	230	371	81
District	Physics Mod 3: Heat	68.2	66	70.4	67.9	69.6	393	194	199	324	69
District	Physics Mod 4: Light	49.2	46.5	51.9	48.9	50.7	429	213	216	354	75
District	Physics Mod 5: Elect	66.1	65.9	66.3	67.5	58.5	345	179	166	292	53

Assessing Attitudes in Science
Grades 6-8

Key: A=Always, F=Frequently, S=Sometimes, R=Rarely, N=Never
Numbers indicate percentage of students selecting the response.
Data based on about 800 respondents. Survey given early fall and late spring, 1995.

		A	A	F	F	S	S	R	R	N	N
		Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
1.	Science classes are fun.	3.8	8.6	7.7	24.3	47.7	45.6	26.5	14.5	14.3	7.0
2.	Science classes increase my curiosity.	6.7	11.3	17.0	25.7	39.2	38.3	22.0	17.2	14.7	7.5
3.	The things studied in science classes are useful to me in daily living.	8.4	8.5	25.3	20.7	35.0	38.2	18.1	25.1	12.2	7.6
4.	Science classes help me test ideas I have.	11.4	9.3	20.5	20.7	32.1	33.0	20.9	22.4	15.1	14.7
5.	My science teacher frequently admits to not having answers to my questions.	24.9	16.5	26.4	12.2	23.1	27.5	12.0	29.4	9.9	14.4
6.	Science class provide me with skills to use outside of school.	9.3	10.0	18.1	19.1	34.2	37.1	21.5	23.1	15.8	10.7
7.	My science class deals with the information produced by scientists.	4.5	15.3	11.1	36.9	31.1	34.0	31.3	10.0	20.1	3.8
8.	Science classes are exciting.	7.2	8.7	15.1	22.2	39.7	34.9	22.0	20.8	14.3	13.4
9.	Science classes provide a chance for me to follow-up on questions I have.	7.4	11.8	15.6	18.5	35.9	35.2	20.4	24.6	15.9	9.9
10.	Science teachers encourage me to question.	8.3	19.0	14.2	22.7	30.0	30.2	24.5	16.8	21.5	11.2
11.	All people can/do practice basic science.	4.6	32.5	12.3	25.7	30.0	27.4	24.1	8.2	26.5	6.2
12.	Being a scientist would be fun.	16.6	13.2	14.4	19.0	31.3	30.1	18.3	14.5	17.0	23.2
13.	Being a scientist would make a person feel important.	12.3	14.2	14.3	23.2	29.4	37.0	22.3	13.7	20.1	11.8
14.	Science classes are boring.	12.1	17.0	13.4	19.8	43.5	32.7	16.1	19.8	13.1	10.6
15.	Being a scientist would be lonely.	12.1	12.5	15.5	13.3	32.5	37.7	19.0	19.2	18.2	17.2
16.	Being a scientist would make a person rich.	11.7	7.3	18.1	16.1	37.0	48.2	17.6	17.7	12.5	10.7
17.	Being a scientist would mean giving up some of the things of interest.	14.4	12.8	16.7	18.3	30.4	36.7	16.1	15.6	18.4	16.5
18.	Scientists discover information that is difficult to understand.	22.7	23.0	24.1	29.8	29.3	35.4	9.4	7.2	9.9	4.6

NATIONAL SCIENCE EDUCATION CONTENT STANDARDS ANALYSIS
DES MOINES PUBLIC SCHOOLS

K-4	K	1	2	3	4
Unifying Concepts and Processes					
• Systems, order, and organization	T	S	S	S	S
• Evidence, models, and explanation	M	S	S	S	T
• Change, constancy, and measurement	M	S	S	T	T
• Evolution and equilibrium	M	S	S	S	M
• Form and function	S	S	S	S	M
Science as Inquiry. All students should develop					
• Abilities necessary to do scientific inquiry	T	T	T	T	T
• An understanding about scientific inquiry	T	T	T	T	S
Physical Science. All students should develop an understanding of					
• Properties of objects and materials	T	T	T	T	T
• Position and motion of objects	S	T	M	N	M
• Light, heat, electricity, and magnetism	S	S	N	N	S
Life Science. All students should develop an understanding of					
• The characteristics of organisms	S	S	T	T	S
• Life cycles of organisms	S	S	T	T	T
• Organisms and environment	M	S	T	S	T
Earth and Space Science. All students should develop an understanding of					
• Properties of earth materials	M	S	M	T	T
• Objects in the sky	M	N	S	N	M
• Changes in earth and sky	M	N	S	N	S
Science and Technology. All students should develop an understanding of					
• Abilities of technological design	M	S	T	M	T
• Understanding about science and technology	M	S	S	M	S
• Abilities to distinguish between natural objects and objects made by humans	M	S	S	M	T
Science in Personal and Social Perspectives. All students should develop an understanding of					
• Personal health	S	S	T	T	T
• Characteristics and changes in populations	M	S	M	N	S
• Types of resources	S	S	T	T	T
• Changes in environments	S	S	S	S	T
• Science and technology in local challenges	N	S	M	M	S
History and Nature of Science. All students should develop understanding of					
• Science as a human endeavor	M	S	M	S	S
• Nature of science	M	S	N	M	M
• History of science	N	N	N	M	M

Key: t-thorough coverage; s-some coverage; m-minimal coverage; n-not covered.

APPENDIX C

NATIONAL SCIENCE EDUCATION CONTENT STANDARDS ANALYSIS
DES MOINES PUBLIC SCHOOLS

5-8	5	6	7	8
Unifying Concepts and Processes				
• Systems, order, and organization	S	S	T	S
• Evidence, models, and explanation	T	S, T	S	ST
• Change, constancy, and measurement	T	S	S	T
• Evolution and equilibrium	N	M	T	M, S
• Form and function	T	M	T	T, S
Science as Inquiry. All students should develop				
• Abilities necessary to do scientific inquiry	T	T	T	T
• An understanding about scientific inquiry	T	T	T	T
Physical Science. All students should develop an understanding of				
• Properties and changes in properties in matter	T	T	S	M, S
• Motions and forces	T	N	M	T
• Transfer of energy	T	S	S	T, S
Life Science. All students should develop an understanding of				
• Structure and function in living systems	S	T	S	S
• Reproduction and heredity	S	S	S	N
• Regulation and behavior	S	S	T	M
• Populations and ecosystems	M	M	T	M
• Diversity and adaptations of organisms	M	M	T	M
Earth and Space Science. All students should develop an understanding of				
• Structure of earth system	N	S	T	N
• Earth's history	N	S	S	N
• Earth in the solar system	N	N	T	N
Science and Technology. All students should develop				
• Abilities of technological design	T	T	M	S
• Understanding about science and technology	T	T	S	S
Science in Personal and Social Perspectives. All students should develop an understanding of				
• Personal health	S	T	T	M
• Populations, resources, and environments	S	T	T	M
• Natural hazards	M	S	S	M
• Risks and benefits	M	S	S	S
• Science and technology in society	T	T	S	T
History and Nature of Science. All students should develop understanding of				
• Science as a human endeavor	T	T	T	T
• Nature of science	T	T	T	T
• History of science	N	T	S	T

Key: t-thorough coverage; s-some coverage; m-minimal coverage; n-not covered.

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NATIONAL SCIENCE EDUCATION CONTENT STANDARDS ANALYSIS
DES MOINES PUBLIC SCHOOLS

9 - 12

	Earth Science	Applied Science	Intro	Biology	Chemistry	Physics	Biology II
Unifying Conepts and Processes							
• Systems, order, and organization	S	S	M	T	S	S	T
• Evidence, models, and explanation	S	M	S	T	T	S	T
• Change, constancy, and measurement	S	S	S	T	T	S	T
• Evolution and equilibrium	T	N	N	T	S	S	T
• Form and function	S	M	M	T	M	S	T
Science as Inquiry. All students should develop							
• Abilities necessary to do scientific inquiry.	S	M	S	S	T	T	T
• An understanding about scientific inquiry.	S	M	S	T	T	T	T
Physical Science. All students should develop an understanding of							
• Structure of atoms	S	S	S	S	T	S	M
• Structure and properties of matter	S	S	S	S	T	S	M
• Chemical reactions	M	M	S	S	T	M	S
• Motions and forces	S	S	S	S	M	T	M
• Conservation of energy and increase in disorder	M	M	S	S	T	T	S
• Interactions of energy and matter	S	M	S	T	S	T	S
Life Science. All students should develop an understanding of							
• The cell	N	M	N	T	N	N	T
• Molecular basis of heredity	N	M	N	T	M	N	T
• Biological evolution	S	M	N	T	N	N	T
• Interdependence of organisms	S	S	N	T	N	N	T
• Matter, energy, and organization in living systems	N	S	N	T	M	S	T
• Behavior of organisms	N	S	N	S	N	N	T
Earth and Space Science. All students should develop an understanding of							
• Energy in the earth system	T	M	N	M	M	T	N
• Geochemical cycles	T	N	N	M	N	M	N
• Origin and evolution of the earth system	T	M	N	S	N	S	S
• Origin and evolution of the universe	T	M	N	M	M	S	M
Science and Technology. All students should develop							
• Abilities of technological design	M	S	M	M	S	T	T
• Understanding about science and technology	S	S	M	M	S	T	T
Science in Personal and Social Perspectives. All students should develop an understanding of							
• Personal and community health	N	T	N	S	M	N	T
• Population growth	N	M	N	T	N	N	M
• Natural resources	S	S	M	S	M	M	N
• Environmental quality	S	S	N	T	M	M	S
• Natural and human-induced hazards	S	S	M	S	S	M	S
• Science and technology in local, national, and global challenges	S	S	M	S	S	S	S
History and Nature of Science. All students should develop understanding of							
• Science as a human endeavor	T	T	S	S	S	T	T
• Nature of scientific knowledge	T	M	S	S	S	T	T
• Historical perspectives	S	M	S	S	S	S	T

Key: t-thorough coverage; s-some coverage; m-minimal coverage; n-not covered.

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